PRELIMINARY REPORT ON A RECENTLY DISCOVERED PLEISTOCENE CAVE DEPOSIT NEAR CUMBERLAND, MARYLAND.

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INTRODUCTION.

The recent fortunate discovery of Pleistocene mammal remains in cave deposits near Cumberland, Maryland, adds one more to the rather limited number of such occurrences and promises to be of great importance in working out the comparatively little known Pleistocene mammalian life of the eastern United States. It may also aid in the proper correlation of these and similar deposits of the East with the better known Pleistocene beds of other parts of the country.

The preliminary investigation of the Cumberland Cave deposit made last October produced most encouraging results. Over 100 specimens were secured, consisting principally of jaws and jaw fragments, which represent 22 recognizable genera, including one genus now exclusively African, and at least 29 species, most of which are apparently extinct, or are now living in remote localities. The work of exploration again taken up by the writer in May of the present year has already added several other forms to the list, and is yielding better material of many of the forms represented in the collection of last autumn. This material will be published with the final results and conclusions at a later date when the exploration is completed.

The location of this important find is at the bottom of a deep cut of the Western Maryland Railway where it passes through the north end of a spur or ridge of limestone near the little village of Corrigansville, at the mouth of Cash Valley, about 4 miles northwest of Cumberland. The ledge is here upturned at an angle of about 90°, the roadway cutting it nearly at right angles, and the excavation is about 100 feet deep at the point where the fossil-bearing deposits were exposed. When first observed the workmen naturally regarded the bones as those of animals now living in the neighborhood, and beyond exciting their curiosity at finding them buried in the rocks and débris of a small cavern at so great a depth, no particular interest

was aroused. I was told that quantities of the material were destroyed by the steam shovel and dynamite in making the excavation, while many specimens were picked up by the workmen and others and carried away as curiosities. After the cut had been completed the locality was visited by Mr. Raymond Armbruster, of Cumberland, Maryland, and Mr. George Roeder, of Swetnan, Virginia, who, obtaining a few specimens from the still undisturbed deposits outcropping at the side of the excavation, recognized the possible scientific value of the material and reported it to the United States National Museum. The credit of the discovery therefore belongs entirely to these gentlemen, and especial praise is due to Mr. Armbruster for the subsequent interest and for the assistance he has given in securing this material for science. It seems appropriate in this connection to express my obligation to these gentlemen and also to Mr. G. H. Friend, principal assistant engineer in charge of the Cumberland division of the Western Maryland Railway, and Mr. Martin Gallagher, industrial commissioner, for their interest in the work and their assurance of hearty cooperation in continuing the investigation of the still unexplored deposits. Thanks are also due Mr. G. C. Hendrickson, of Cumberland, for placing at my disposal a portion of a skull taken from the railroad cut, representing an extinct species of the dog family.

GEOLOGIC HISTORY AND AGE OF DEPOSITS.

The upturned ledge of rock in which the cave deposits occur represents the lower Helderbergian division of the Devonian. It forms a segment of the much eroded west wing of a great anteclinal fold having a nearly north and south axis. The total thickness of the formation at this place is about 900 feet, but the cave chamber containing the fossil bones and other caverns in the immediate vicinity seem to be confined to a single stratum not more than 20 feet thick. The small size and peculiar disposition of the caverns in a single plane suggest a true fissure cave, although it can not properly be so called. The cause for this resemblance is probably due to the upturned condition of the strata which brings the bedding plane and hence the line of cleavage to a nearly perpendicular position. This has for ages given free access to the corrosive action of the surface waters along the line of strike which easily following the lines of cleavage of the rocks, would spread downward to great depths and laterally only along the line of outcrop, without forming caverns of any great size.

PROBABLE MANNER OF ENTOMBMENT.

In making the railway cut, several small chambers at higher levels than the one containing the bones were encountered, and before the work of excavation began there was said to have been an opening to the surface on the crest of the hill directly above the middle of the

present roadbed. This opening so nearly overhead probably at one time served as a trap through which were introduced the animals whose remains are now in the deposits of the bone cavern. There are other openings along the line of outcrop of the ledge, one of them at about the same level with the bone-bearing deposits, appearing at the north end of the ridge where it slopes abruptly down into the Wills Creek Valley. These openings may or may not have communicated at one time with the caverns intersected by the railroad cut, but probably had nothing to do with the accumulation of material in the latter.

From Brown's [1] account of the Conard Fissure, it would seem that the conditions governing the accumulation of material in the Cumberland Cave were quite similar. The bones for the most part are much broken, yet show no signs of being water worn. They are found scattered fairly uniformly throughout the entire mass of unstratified accumulations which consist entirely of cave clays and breccias, unevenly hardened and more or less cemented together by stalactitic materials. There is an almost entire absence of admixture of sand or gravel, or in fact anything that would suggest the possible aid of stream currents in sorting or placing the material during the process of accumulation. It seems probable therefore that this little fossil-bearing pocket represents the accumulation of a great number of years in which the conditions were such that animals, both large and small, sometimes by accident, sometimes by being dragged there by carnivores, occasionally became entrapped in the upper chambers of the cave. Thus carcasses of the larger animals were probably caught and held in crevices not far beneath the surface of the ground and remained there until the bones were sufficiently macerated to allow them to fall apart by their own weight, when the separated bones would work their way by gravity to lower and lower levels until they finally came to rest at the bottom of the cavern then a hundred feet or more below the surface of the ground. The broken and scattered condition of the bones found in the deposits would be accounted for in this way.

The mammals represented in the collection are undoubtedly Pleistocene and probably pre-Wisconsin in age; a more exact geological horizon of the deposits, however, can not at present be determined. From this preliminary study they appear to be about the equivalent of the Port Kennedy cave deposits, the fauna of which was described by Cope [2] and is now regarded as early Pleistocene. The Cumberland Cave fauna may represent a somewhat later phase. But this supposition can be verified or disproven only by a careful comparison of the material with that from Port Kennedy and other localities.

[1] Memoirs Amer. Mus. Nat. Hist., vol. 9, pt. 4, 1907, pp. 163.
[2] Journ. Acad. Nat. Sci. Phila., vol. 11, 1899, pp. 194-267.

LIST OF FAUNA REPRESENTED.

Equus sp.
Tapirus cf. *haysii* (?) Leidy.
Taurotragus americanus Gidley.
Platygonus cf. *vetus*? Leidy.
Ursus (*Euarctos*) cf. *americanus* ? Pallas.
Ursus (*Euarctos*) *vitabilis*, new species.
Canis armbrusteri, new species.
Canis sp.
Vulpes (?) sp.
Mustela cf. *vison* Schreber.
Lepus americanus ? Erxleben.
Lepus sp.
Ochotora cf. *princeps*.
Synaptomys sp.
S. (*Myctomys*) cf. *borealis* (Richardson).
Microtus cf. *chrotorrhinus* Miller.
Microtus sp.
Neotoma sp.
Napæozapus sp. probably new.
Peromyscus cf. *leucopus* (Rafinesque).
Erethizon, two new species.
Marmota cf. *monax* Linnæus.
Sciuropterus cf. *alpinus* Richardson.
Sciurus hudsonicus Erxleben.
Myotis, new species (?).
Vespertilio grandis Brown.
Vespertilio sp.
Blarina cf. *brevicauda* (Say).

DESCRIPTION OF NEW SPECIES AND NOTES ON CANIDS.

CARNIVORA.

Genus URSUS (EUARCTOS) Gray.

This subgenus is represented by at least two species, as shown by many specimens consisting of foot and limb bones, and a few upper and lower jaw portions containing teeth. At least one of these forms is new and is described below.

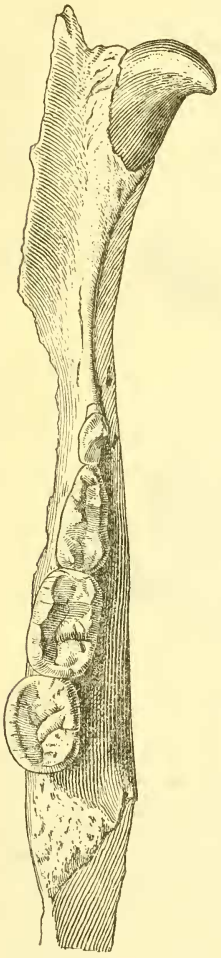
URSUS (EUARCTOS) VITABILIS, new species.

Type.—Lower jaws, nearly complete, lacking incisors (Cat. No. 7665, U. S. Nat. Mus.), see figs. 1, 1*a*, p. 97.

Description.—About the size of *U.* (*Euarctos*) *americanus*, but differs from that species in (1) comparatively larger canines; (2) wider space

between the anterior cheek-teeth, combined with a less wide branching of the horizontal rami in general; (3) a relatively larger symphysis, which is more sharply constricted and more flattened laterally behind the canines; and (4) longer diastema between canines and cheek-teeth.

A second specimen, a portion of the right maxillary (Cat. No. 7664, U. S. Nat. Mus.), is probably referable to this species. It contains the two molars, which do not differ materially, except in their somewhat smaller size, from the corresponding ones of *U. americanus*.



1*a*

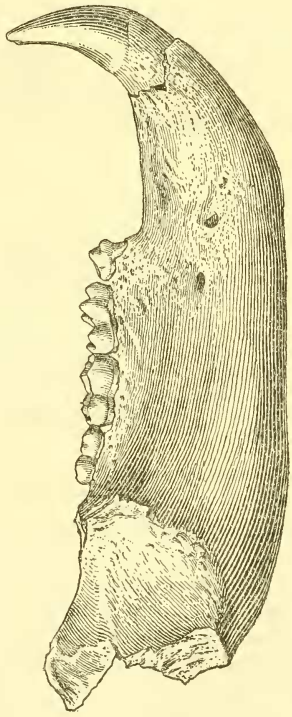


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FIG. 1.—URSUS (EUARCTOS) VITABILIS. TYPE-SPECIMEN. OUTER VIEW OF RIGHT LOWER JAW, 2-3 NAT. SIZE. *a*. SUPERIOR VIEW, NAT. SIZE.

Genus CANIS.

There are at least two carnivors represented in the collections which are referable to *Canis* as that genus is at present understood. One species is here described.

CANIS ARMBRUSTERI,[1] new species.

Type.—Portion of a left lower jaw (Cat. No. 7662, U. S. Nat. Mus.), containing three teeth, p_4 to m_2. (See figs. 2, 2*a*.)

Paratypes.—Portion of a right lower jaw (Cat. No. 7661, U. S. Nat. Mus.) containing four teeth, p_2 to m_1 (see figs. 3, 3*a*), and the alveoli for p_1, and the canine; and portions of the right and left lower jaws

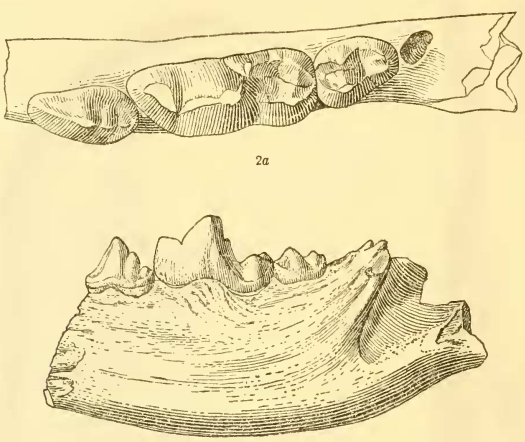

Fig. 2.—Canis armbrusteri, type-specimen, portion of left lower jaw. 2. Outer view, 2-3 nat. size. *a*. Superior view, nat. size.

of another individual (Cat. No. 7482, U. S. Nat. Mus.), containing teeth (see figs. 5, 5*a*), which include the carnassials of both sides, and m_2 and the posterior half of p_4 of the left side.

Description.—Size slightly less than that of *C. occidentalis*, as that species has been defined by Miller,[2] but the tooth characters indicate an animal quite distinct from any of the true wolves. Its principal differences are seen in the greater relative depth of jaw, smaller canine, more simple p_2 and p_3, the presence of a posterior basal tubercle on p_4, and in the relatively larger heel of the carnassial. The paraconid

[1] This species is named in honor of Mr. Raymond Armbruster, through whose efforts the Cumberland Cave deposits were first brought to scientific notice.

[2] Smiths. Misc. Coll., vol. 59, No. 15, 1912, p. 2.

also is less expanded at base, with more perpendicular anterior face. The metaconid is larger and higher placed, while the protoconid is less broad and full, as seen from the inner side. The carnassials as a whole suggest those of the jackal, fox, or coyote rather than those of the wolf. The anterior functional premolars are relatively small and have no accessory tubercles, while p_4 is fully as heavy and robust as in the wolves and carries, besides the usual secondary cusp, an extra posterior basal cusp in addition to the cingulum, as in the jackals and coyotes. In the wolves and dogs (see figs. 4, 4*a*) p_4 has but one secondary cusp and a cingulum heel, but p_2 and p_3 usually have a well-developed posterior secondary cusp.

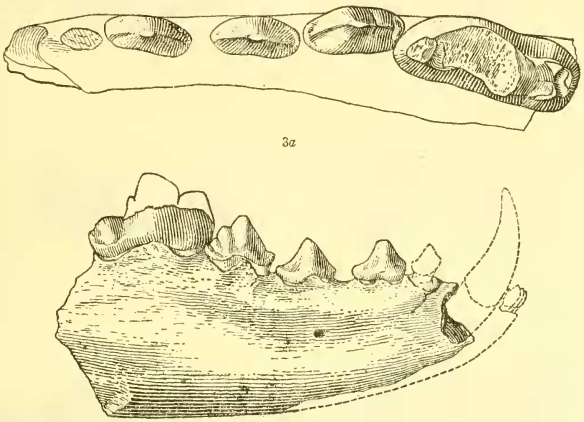

FIG. 3.—CANIS ARMBRUSTERI. CAT. NO. 7661, PORTION OF RIGHT LOWER JAW. OUTER VIEW, 2-3 NAT. SIZE. *a*. SUPERIOR VIEW, NAT. SIZE.

ADDITIONAL NOTES ON THE LOWER TEETH OF THE CANIDS.

The carnassials in the canids, except within the narrow limits of individual variation, are very constant in character and present certain modifications which for the most part readily determine the group to which they belong. These, taken together with the combined characters of the other teeth, are clearly diagnostic, not only of the various larger groups of the family, but even of groups now included in the genus *Canis*. Thus in the true wolves and domestic dogs the heel of the lower carnassial is short (being less than one-fourth the total length of the crown) and is narrower than the talonid; the paracoid is relatively large, with antero-posteriorly lengthened base, so that the anterior face slopes backward at a con-

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8a

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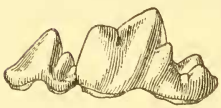
7a



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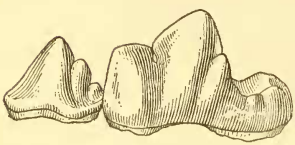

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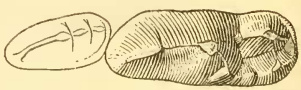

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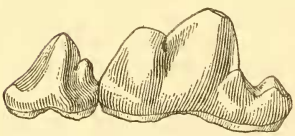

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FIGS. 4-8.—LOWER FOURTH PREMOLARS AND CARNASSIALS OF CANIDS. ALL NATURAL SIZE. 4, 4*a*, CANIS OCCIDENTALIS, CAT. NO. 1006, U.S.N.M. 5, 5*a*, CANIS ARMBRUSTERI, CAT. NO. 7482, U.S.N.M. 6, 6*a*, CANIS (LYSCISCUS) LATRANS, CAT. NO. 3618, U.S.N.M. 7, 7*a*, CANIS AUREUS, CAT. NO. 181500, U.S.N.M. 8, 8*a*, VULPES, CAT. NO. 7183, U.S.N.M.

siderable angle; the body, or column, of the protocoid is full and rounded, and the metacoid is greatly reduced, appearing in the living species as a small tubercle on the inner posterior angle of the protocoid near its base (see fig. 4). Similar and fully as important differences are observed in the upper carnassial. The character of the premolars have been stated above, page 98.

The constancy of these characters seems to mark the wolves and dogs as closely related members of a natural group, and tends to support the belief held by many, and recently especially expressed by Miller,[1] that all the domestic breeds of dogs were originally derived from some species of true wolf, and not from the jackal as has been held by some other authorities.

The subgeneric distinction of the coyotes (*Lyciscus*) is well substantiated by their tooth characters (see figs. 6, 6*a*). The teeth in this group are all relatively narrower and less robust than in the wolves, while the carnassial has more the general proportions of those of the jackal or fox (see figs. 7, 8). Thus the heel is less reduced, with the two principal cusps more trenchant and more nearly subequal; the metaconid is more prominent; the paraconid shorter; and the bodies or columns of the paraconid and protoconid are less full and rounded, leaving the cutting blades of the trigonid much sharper. The p_4 has two posterior tubercles and a posterior basal cingulum, and p_2 is usually simple.

Both p_2 and p_3 are usually simple in the jackals while the crowns of all the premolars are relatively higher and shorter than are those of the coyotes.

The foxes differ from the other canids in having relatively lower crowned, smaller carnassials as well as in the greater relative length of the canine, as pointed out by Miller.[2]

In *Cuon* and *Lycaon* the lower carnassials have a completely single-cusped, trenchant heel, which distinguishes them from all the other living canids. There are differences likewise in the upper carnassials and other teeth, especially the molars, which separate this group from *Canis* and seem to ally it to some of the extinct forms of the late Oligocene, of the *Temnocyon*, or *Hyænocyon* type.

Some of the characters mentioned above have been recognized and used by various investigators, but others of seemingly equal importance seem to have been overlooked.

Herewith is a list of the principal characters of the lower teeth which seem to be diagnostic for some of the groups of living canids.[3] *Canis armbrusteri* is also included.

[1] Catalogue of Mammals of Western Europe, 1912, p. 313.

[2] Idem, p. 326.

[3] This is not a complete classification and is only given to show some of the more important tooth characters, especially of the carnassials. The South American fox-like dogs are not included here.

a^1. Lower carnassials with trenchant heel. *Cuon, Lycaon.*

a^2. Lower carnassial with heel more or less basin-shaped with two prominent cusps.

b^1. Heel of carnassial reduced, narrower than trigonid, length contained in total length of tooth about four times; main cusps of carnassial heel, and anterior pair of m_2 as well, very unequal in size.

c^1. Protoconid and paraconid of carnassial very large and full, subconic to summit. Premolars robust, with but one posterior tubercle each on p_3, p_4, and usually on p_2. Each premolar has besides a posterior basal shelf formed by the cingulum. *Canis* (wolves and domestic dogs).

c^2. Anterior premolars greatly reduced. *Epicyon* (extinct).

b^2. Heel of carnassial less reduced, about equaling triconid in width, length of heel contained in total length of tooth three and one-half times or less. Protoconid and paraconid of carnassial less full and more bladelike. Innercusps of carnassial heel and anterior pair of m_2 relatively larger, sometimes almost subequal with the opposing outer cusps.

c^1. Molars and premolars relatively narrow or compressed, p_4 with two posterior tubercles and basal cingulum, p_3 and usually p_2 with a single posterior tubercle. Canines large, but relatively longer than in the wolves. *Canis* (*Lysciscus*) (coyotes).

c^2. Premolars relatively shorter as in the wolves but with higher more pointed cusps. P_4 with two posterior tubercles and a cingulum as in the coyotes, but with no posterior tubercles on the other premolars. *Canis aureus*, etc. (jackals).

c^3. Carnassials proportionally small with relatively lower crowns, p_4 with one posterior tubercle and a posterior basal cingulum cusp, p_2 and p_3 with posterior tubercles obsolete or wanting.

d^1. Tooth cusps prominent, trenchant; heels of premolars short. *Vulpes* (red fox).

d^2. Tooth cusps less prominent; heel of carnassial broad with posterior inner tubercle (entoconid) small; heels of premolars long. *Alopex* (Arctic fox).

c^4. Carnassial moderately robust with short paraconid, and long, broad heel; premolars relatively long, low and simple, except p_4, which has two well-defined posterior tubercles and a posterior basal cingulum; canine and anterior premolars relatively small, jaw of great relative depth in region of carnassial. *Canis armbrusteri* (extinct).

In the new species from the Cumberland Cave, *C. armbrusteri*, the general form of the carnassial is more like that of the coyote and jackal, and in the heavy three-cusped p_4 combined with the relatively small, simple, single-cusped p_2 and p_3 and small canine it resembles the jackal despite its much greater size. The relatively deeper jaw and broader more basinlike heel of the carnassial would, however, scarcely warrant considering it a member of that group. It probably represents an extinct group of dogs which when better known may be referred to a new genus.